IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: **Good et al.**	Confirmation No.: **4461**
Serial No.: **10/613,409**	Group Art Unit: **1791**
Filing Date: **July 3, 2003**	Examiner: **Christopher T. Schatz**
For: **Hot Melt Adhesive**	

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Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

APPELLANT'S BRIEF PURSUANT TO 37 C.F.R. § 41.37

This brief is being filed in support of Appellant's appeal from the final rejections of claims 1-8, 10, 12, 13, 22 and 25-29, dated January 5, 2010. A Notice of Appeal was filed on April 5, 2010.

1. REAL PARTY IN INTEREST

The real party in interest is Henkel Corporation, successor in interest to National Starch and Chemical Investment Holding Corporation.

2. RELATED APPEALS AND INTERFERENCES

Appellant is not aware of any related appeals and interferences. See appendix entitled RELATED PROCEEDINGS APPENDIX.

3. STATUS OF CLAIMS

Pending:	Claims 1-8, 10, 12, 13, 22 and 25-29
Rejected:	Claims 1-8, 10, 12, 13, 22 and 25-29
Objected to:	None
Allowed:	None
Cancelled:	9, 11, 14-21, 23 and 24

Withdrawn: None

Appealed: Claims 1-8, 10, 12, 13, 22 and 25-29

Appeal Withdrawn: None.

4. STATUS OF AMENDMENTS

No claim amendments were filed subsequent to the final rejection dated January 5, 2010.

5. SUMMARY OF CLAIMED SUBJECT MATTER

In one aspect, and as reflected in independent claim 1, the claimed inventions are generally directed to a low application temperature hot melt adhesive that has a viscosity of about 800-1500 cPs at the application temperature below 250°F (see claim 1; Specification at paragraphs [0004]-[0005]). For this adhesive, the difference between the heat stress value and the adhesive application temperature of the bonded adhesive is 100°F or less (*Id.*; paragraph [0032]). In contrast to previously known conventional and low application temperature adhesives, the resistance to high temperatures and stresses is much closer to the application temperature of the adhesive of the invention (paragraph [0017]).

In another aspect, and as recited in independent claim 26, the claimed inventions are directed to a low application temperature hot melt adhesive that that is applied at a temperature of below 250°F, has a viscosity between about 800 cps and 1500 cps at an adhesive application temperature, the bonded adhesive heat stress value and the adhesive application temperature are separated by 100°F or less, the crystallization of the adhesive when analyzed by differential scanning calorimeter from application temperature to room temperature at a cooling rate of 150°C/min yields a time between initial cooling and crystallization of 0.35 minutes or greater, and is thermally stable at the application temperature for a period of one hundred hours as indicated by a viscosity change within plus/minus ten percent of the original application viscosity (see claim 26; Specification at paragraphs [0021], [0032], [0033] and [0034]).

6. GROUND OF REJECTION TO BE REVIEWED ON APPEAL

The first issue on appeal is:

- whether, at the time of filing, one of ordinary skill in the art would have found the invention recited in claims 1-5, 8, 10, 12-13: 22 and 25-29 obvious under 35 U.S.C. § 103(a) over EP 0934990A1 (hereinafter "Mehaffy").

The second issue on appeal is:

- whether, at the time of filing, one of ordinary skill in the art would have found the invention recited in claims 6 and 7 obvious under 35 U.S.C. § 103(a) over Mehaffy in view of Baetzold et al. (U.S. 5,827,913, hereinafter "Baetzold");

7. ARGUMENT

I. Rejection of Claims 1-5, 8, 10, 12-13: 22 and 25-29 under 35 U.S.C. § 103(a) over Mehaffy

Mehaffy does not render obvious the inventions recited in claims 1-5, 8, 10, 12-13, 22 and 25-29.

Mehaffy fails to teach or suggest an adhesive applied at a temperature of below 250°F which has a bonded heat stress value that is separated from the application temperature by not more than 100°F, let alone an adhesive that is applied at a temperature of about 200°F, or an adhesive that is applied at or below 200°F.

Mehaffy is directed to an adhesive with an application temperature range of 200-300°F, and heat stress value is at or above 115°F (Mehaffy, page 7, Table 1). According to Table I in Mehaffy, the difference between the heat stress values and the application temperatures of adhesives (applied at 250°F) ranges from 115-125°F. While the Office has acknowledged the difference between the heat stress and application temperature is more than that is claimed by Applicants, the Office urges that such adhesives are disclosed by Mehaffy as being able to be applied at temperatures down to 200°F (Office Action dated June 9, 2010, page 4, first paragraph). Applicants disagree with the Office's assertion that if the adhesives reported in Table I were applied at 200°F, the resultant difference between the application temperature and the heat stress would be less than 100°F.

It is well known in the art that the heat stress values are dependent upon the application temperature. Although Mehaffy's exemplified adhesive has a heat stress value of 115°F when applied at 250°F, a skilled artisan would recognize that the heat stress value would differ when the same adhesive is applied at temperature below 250°F, or applied at a temperature of about 200°F or applied at a temperature at or below 200°F. A skilled artisan understands that as the application temperature of an adhesive decreases, the heat stress value

also decreases. Hence, the difference between the heat stress value and the adhesive application temperature would be greater than that reported by Mehaffy's adhesives are applied at temperature lower than 250°F.

Moreover, the Applicants have stressed that a skilled artisan would realize that Mehaffy's adhesive would not have the viscosity range of from about 800 to 1500 cPs at application temperature below 250°F. The applicants have noted that it is well known in the art that for every increment of 25°F decrease of the application temperature, the viscosity of the hot melt adhesive increases about 40% (Reply to the Office Action, dated September 8, 2009, page 7). In response, the Office has indicated that the Applicants have failed to show proof that the viscosity will increase such amounts (*Id.*).

The Applicants have shown a theoretical and mathematical relationship which shows that for every increment of 25°F decrease in the application temperature of an adhesive, the viscosity of the adhesive increases about 40% (Response to Final Office Action, dated April 5, 2010). According to "*Plastics Technology Handbook*, 4th Ed," Chanda, M. & Roy, S., CRC Press 2007, section 3.2.16.4, titled Effect of Temperature on Polymer Viscosity (see EVIDENCE APPENDIX), the viscosity of most polymers change with temperature and this change can be described by the Arrhenius equation, shown below:

$n = n_0 e^{(-Ea/T)}$ where n = viscosity at T
n_0 = viscosity at T approaches 0K
E_a = activation energy
T = temperature in Kelvin

The relationship of the temperature and rate (of polymer viscosity) can then be expressed as:

$$\frac{n_{T1}/n_0 = e^{(-Ea/T1)}}{n_{T2}/n_0 = e^{(-Ea/T2)}}$$

$$\frac{n_{T1}}{n_{T2}} = \frac{e^{(-Ea/T1)}}{e^{(-Ea/T2)}}$$

$$(n_{T1}/n_{T2}) = e\text{^}\{E_a(1/T_1 - 1/T_2)\}$$

$$\ln(n_{T1}/n_{T2}) = \ln\{e\text{^}(E_a(1/T_1 - 1/T_2))\}$$

$$\ln(n_{T1}/n_{T2}) = E_a(1/T_1 - 1/T_2)$$

To show that for every 25°F decrease in application temperature of Mehaffy's adhesive would result in about a 40% increase in viscosity, T_1 (250°F = 121 °C = 394K), T_2 (225°F = 107 °C = 380K), E_a (estimated as $4000K^{-1}$ for general polymer) and n_{T1} (set as 1205 cP from Mehaffy's adhesive sample 1 from Table 1, page 7) were substituted in the above equation.

The calculated Mehaffy's adhesive has a viscosity of about 1751 cPs at 225°F (see calculation below).

$\ln(1205\text{cP}/n_{T2}) = 4000\ \text{K}^{-1}\ (1/394\text{K} - 1/380\text{K})$

$n_{T2} = 1751$ cPs

Similar viscosity calculation was conducted for Mehaffy's adhesive Sample I at 200°F (93°C = 366K). The calculated viscosity was 2620 cPs at 200°F.

Based on the Arrhenius equation and Mehaffy's reported viscosity value at 250°F, a skilled artisan would not be led to believe the viscosity of Mehaffy's adhesive would be below about 1500 cPs at application temperatures of 250°F or lower with a heat stress delta of less than 100°F.

Accordingly, if Mehaffy's adhesives were to be applied at 225°F, the viscosity range would be greater than about 1600 cps. If Mehaffy's adhesive was applied at 200°F, as exemplified in the instant invention, the viscosity range would be greater than about 2600 cps. At these high viscosity values, a skilled artisan would be led away from utilizing such adhesive on hot melt adhesive equipment/machinery, for majority of commercially employed hot melt application equipment requires a viscosity of below about 1500 cps (Specification, paragraph [0021]). Use of an adhesive with higher viscosity would lead to stringing of the adhesive for the nozzles and improper amount or control of adhesive transfer to the substrate (*Id.*). Hence, one skilled in the art would not look to Mehaffy to develop an adhesive that can be applied at temperature below 250°F.

In contrast to Mehaffy's adhesives, Applicants' have shown that adhesives can be formulated that can maintain a temperature separation of 100°F or less between the application temperature and the adhesive heat stress value. The Office's position that Mehaffy discloses the *same adhesive composition* as the instant application and thus will have the same heat stress value is without merit.

In addition, Mehaffy fails to disclose or suggest a formulated low application temperature hot melt adhesive that has a crystallization time (between initial cooling and crystallization) of 0.35 minutes or greater. Mehaffy also fails to disclose or suggest a formulated low application hot melt adhesive that is thermally stable at the application temperature for a period of one hundred hours.

For at least the foregoing reasons, Appellant submits that the Office's rejection of claim 1-5, 8, 10, 12-13: 22 and 25-29 as obvious under 35 U.S.C. § 103(a) in light of the cited prior art is improper and should be vacated. Accordingly, Appellant respectfully

requests that the Board withdraw the rejection and pass claim 1-5, 8, 10, 12-13: 22 and 25-29 and all claims dependent thereon to allowance.

II. Rejection of Claims 6 and 7 under 35 U.S.C. § 103(a) as being unpatentable over Mehaffy in view of Baetzold

Claims 6 and 7 stand rejected under 35 U.S.C. § 103(a) for alleged obviousness over Mehaffy in view of the Baetzold. Baetzold is cited for its alleged disclosure of a hot melt adhesive that can be used in packaging, and the presence of fragrances and energy absorbing ingredients is well known in the art, and does not remedy the shortcomings of the Office's position with respect to Mehaffy.

Baetzold is directed to encapsulating an ingredient in a hot melt adhesive composition. Baetzold teaches that the encapsulated ingredient may be any known hot melt adhesive formulation ingredient or additive such as antioxidants and fragrances (abstract). The disclosure of Baetzold adds nothing to the disclosure of Mehaffy which would motivate the skilled artisan to formulate an adhesive that can be applied at a temperature below 250°F and which are able to withstand stress at temperatures substantially closer to the temperature of the adhesive's application temperature then heretofore achieved in the art, i.e., the bonded adhesive heat stress value and the adhesive application temperature are separated by 100°F or less. Accordingly, the Office's rejection of claims 6 and 7 under § 103(a) is also inapposite and should be withdrawn. Appellant respectfully requests that the Board withdraw the rejection and pass claims 6 and 7 to allowance.

Conclusion

In view of the foregoing, Appellant requests that this patent application be remanded to the Examiner with an instruction to withdraw the rejection of claims 1-8, 10, 12, 13, 22 and 25-29 under 35 U.S.C. § 103(a).

Respectfully submitted,

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8. CLAIMS APPENDIX

The following claims are involved in the present appeal:

1 (previously presented): A low application temperature hot melt adhesive having a viscosity between about 800 cps and 1500 cps at an adhesive application temperature below 250°F, and wherein the bonded adhesive heat stress value and the adhesive application temperature are separated by 100°F or less.

2 (previously presented): The adhesive of claim 1 that is applied at a temperature of about 200°F.

3 (previously presented): The adhesive of claim 1 that is applied at or below a temperature of 200°F.

4 (previously presented): The adhesive of claim 1 wherein crystallization of the adhesive when analyzed by differential scanning calorimeter from application temperature to room temperature at a cooling rate of 150°C/min yields a time between initial cooling and crystallization of 0.35 minutes or greater.

5 (original): The adhesive of claim 1 that is thermally stable at application temperature for a period of one hundred hours as indicated by a viscosity change within plus/minus ten percent of the original application viscosity.

6 (original): The adhesive of claim 1 further comprising an energy absorbing ingredient.

7 (original): The adhesive of claim 1 further comprising a fragrance.

8 (original): An article of manufacture comprising the adhesive of claim 1.

10 (original): The article of claim 8 which is a carton, case, tray, bag or book.

12 (original): A packaged article contained within, a carton, case, tray or bag, wherein the carton, case, tray or bag comprises the adhesive of claim 1.

13 (original): The packaged article of claim 12 which is a packaged food article.

22 (previously presented): The adhesive of claim3 wherein the bonded adhesive heat stress value and the adhesive application temperature are separated by 90°F or less.

25 (previously presented): The adhesive of claim 1 comprising an ethylene n-butyl acrylate copolymer.

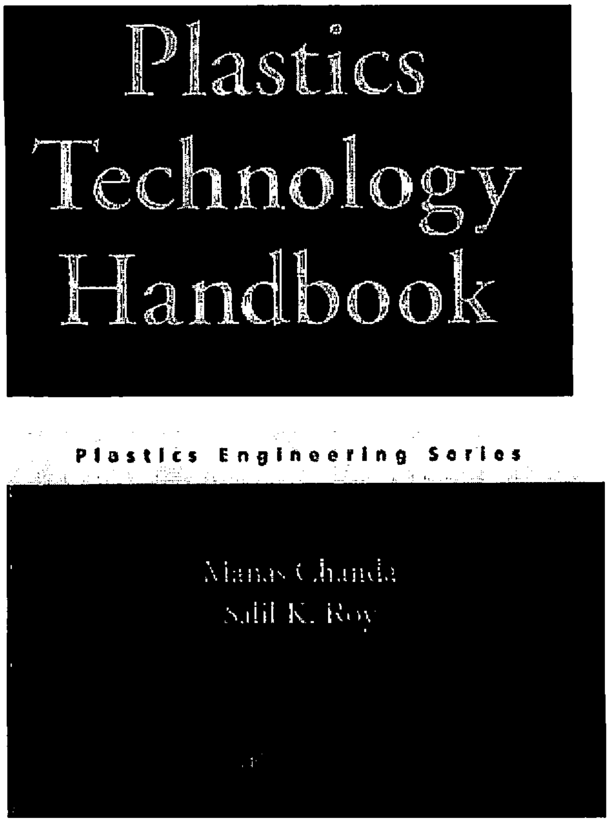
26 (previously presented): A low application temperature hot melt adhesive having a viscosity between about 800 cps and 1500 cps at an adhesive application temperature below 250°F, the bonded adhesive heat stress value and the adhesive application temperature are separated by 100°F or less, the crystallization of the adhesive when analyzed by differential scanning calorimeter from application temperature to room temperature at a cooling rate of 150°C/min yields a time between initial cooling and crystallization of 0.35 minutes or greater: and is thermally stable at the application temperature for a period of one hundred hours as indicated by a viscosity change within plus/minus ten percent of the original application viscosity.

27 (previously presented): The adhesive of claim 1 which comprises 20 wt% of an ethylene n-butyl acrylate copolymer and 10 wt % of an ethylene vinyl acetate copolymer.

28 (previously presented): The adhesive of claim 26 that is applied at a temperature of about 200°F.

29 (previously presented): The adhesive of claim 26 that is applied at or below a temperature of 200°F.

9. EVIDENCE APPENDIX



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3.2.16.4 Effect of Temperature on Polymer Viscosity

The viscosity of most polymers changes with temperature. An Arrhenius equation of the form

$$\eta = Ae^{E/RT} \tag{3.109}$$

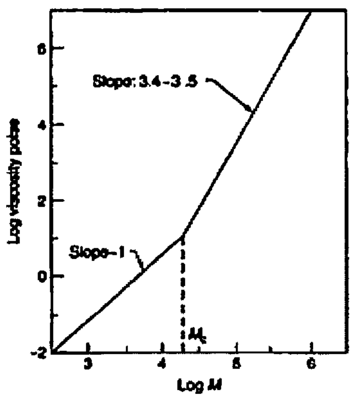

FIGURE 3.30 Dependence of polymer (melt) viscosity on molecular weight (M): a typical plot of log viscosity against log M.

where A is a constant and E is the activation energy, has often been used to relate viscosity and temperature. Constants in the Arrhenius equation can be evaluated by plotting the logarithm of viscosity against the reciprocal of absolute temperature, using shear stress or shear rate as a parameter. The data for most materials give straight line over reasonably large range of temperature.

Whilst the Arrhenius equation can be made to fit experimental data quite well it does nothing to explain the difference between polymers. In this regard, the WLF equation (see Equation 3.27):

$$\log\left(\frac{\eta_T}{\eta_{T_g}}\right) = \frac{-17.44(T - T_g)}{51.6 + (T - T_g)}$$

is more useful. Melt viscosity, according to this equation, is a function of $(T - T_g)$. Thus, for example, a major cause of the difference between the viscosity of poly(methacrylate) at its processing temperature (where $T - T_g \simeq 100°C$) and the

viscosity of polyethylene at its processing temperature (where $T - T_g \simeq 200°C$) is explicable by this relationship. The WLF equation also explains why viscosity is more temperature sensitive with materials processed closer to their T_g, for example, poly(methyl methacrylate), compared with nylon 6.

10. RELATED PROCEEDINGS APPENDIX

No related appeals or interferences are currently pending.